

CLAIMS

What is claimed is:

1. A method of backside navigation comprising:
 - 5 milling a fine fiducial opening through a substrate with a charged particle beam; and endpointing said fine fiducial opening upon delineating a trench isolation structure.
 2. The method according to Claim 1, further comprising:
 - 10 acquiring an image of said delineated trench isolation structure with said charged particle beam;
 - receiving a reference image; and
 - registering said acquired image and said reference image.
 3. The method according to Claim 2, wherein said reference image comprises a computer aided design layout image.
 - 15 4. The method according to Claim 1, wherein endpoint said fine fiducial opening comprises:
 - imaging a floor of said fine fiducial opening with said charged particle beam;
 - detecting a voltage contrast indicating said fine fiducial opening has reached said
 - 20 trench isolation structure; and
 - stopping said milling of said fine fiducial opening upon detecting said voltage contrast.

5. The method according to Claim 1, wherein a width of said fine fiducial opening is substantially sufficient to expose the width of said trench isolation structure.

5 6. A method of backside navigation comprising:

forming a fiducial opening, wherein a portion of a trench isolation structure is delineated;

acquiring an image of said delineated portion of said trench isolation structure;

registering said acquired image and a reference image; and

10 generating position control information as a function of said registered acquired image and said reference image.

7. The method according to Claim 6, wherein said reference image comprises a computer aided design layout image.

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8. The method according to Claim 6, wherein forming said fiducial opening comprises:

forming a coarse fiducial opening, wherein a static device region is delineated;

depositing an oxide layer in said coarse fiducial opening; and

20 forming a fine fiducial opening in said coarse fiducial opening, wherein said portion of said trench isolation structure is delineated

9. The method according to Claim 8, wherein forming said fiducial opening further comprises:

imaging a boundary of said well region to detect a doping deviation in said well region indicative of a presence of said trench isolation structure; and
5 milling said fine fiducial opening substantially at said detected doping deviation.

10. The method according to Claim 8, wherein forming said fiducial opening further comprises:

thinning a substrate prior to forming said fiducial opening; and
10 imaging said substrate to detect said static device region.

11. The method according to Claim 6, further comprising:
making a fiducial marking proximate said fiducial opening; and
maintaining said registration of said acquired image and said reference image as a
15 function of said fiducial marking.

12. The method according to Claim 6, wherein registering said acquired image and said reference image comprises:

generating a cross correlation image as a function of said acquired image and said
20 reference image;
oversampling said cross correlation image;
determining an offset of said oversampled cross correlation image; and
aligning said reference image and said acquired image according to said offset.

13. The method according to Claim 12, wherein registering said acquired image and said reference image further comprises:

5 preprocessing said acquired image, wherein preprocessing comprises one or more processes consisting of rotation adjustment, magnification adjustment, intensity adjustment and filtering.

14. The method according to Claim 12, further comprising:

10 forming a plurality of fiducial openings, wherein each fiducial opening delineates a separate portion of a trench isolation structure within a field of view; acquiring an image of each said delineated portion of said trench isolation structure; registering said image of each delineated portion of said trench isolation structure to a corresponding trench isolation structure in a portion of a trench mask corresponding to said field of view; and

15 generating position control information as a function of said registered acquired images and said portion of said trench mask.

15. A method of forming a backside marker in an integrated circuit comprising:

20 forming a coarse fiducial opening; forming a fine fiducial opening in said coarse fiducial opening, wherein said fine fiducial opening delineates a portion of a trench isolation structure.

16. The method according to Claim 15, wherein said coarse fiducial opening delineates a static device region.

17. The method according to Claim 16, wherein said static device region comprises a
5 well region.

18. The method according to Claim 15, wherein a focused ion beam milling process is utilized to form said fine fiducial opening.

10 19. The method according to Claim 18, wherein forming said fine fiducial opening comprises:

milling at a first focused ion beam current;

milling at a second focused ion beam current as said fine fiducial opening approaches said trench isolation structure, wherein said second focused beam current is less than said

15 first focused ion beam current;

imaging said fine fiducial opening at said second focused ion beam current to detect a first voltage contrast indicative of said fine fiducial opening reaching said trench isolation structure; and

stopping said milling upon detection of said first voltage contrast.

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20. The method according to Claim 15, wherein forming said coarse fiducial opening comprises:

imaging said integrated circuit to detect a position of a static device region;

millling at said first focused ion beam current;

millling at said second focused ion beam as said coarse fiducial opening approaches said static device region;

imaging said coarse fiducial opening at said second focused ion beam current to

5 detect a second voltage contrast indicative of said coarse fiducial opening reaching said static device region; and

stopping said milling upon detection of said second voltage contrast.

21. The method according to Claim 15, further comprising forming an initial
10 opening, wherein said coarse fiducial opening will be formed in said initial opening.